October-November 1968

EMO

Radiological Defence in Canada
On Reorganizing After Nuclear Attack
Nova Scotia Emergency Planning
Canada EMO Blast Tests
Operation Woodburn 1968

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Editor: A. M. STRATON

ROGER DUHAMEL, F.R.S.C. QUEEN'S PRINTER AND CONTROLLER OF STATIONERY OTTAWA, 1968

RADIOLOGICAL DEFENCE IN CANADA

by

Mr. A. H. Blake, Canada Emergency Measures Organization

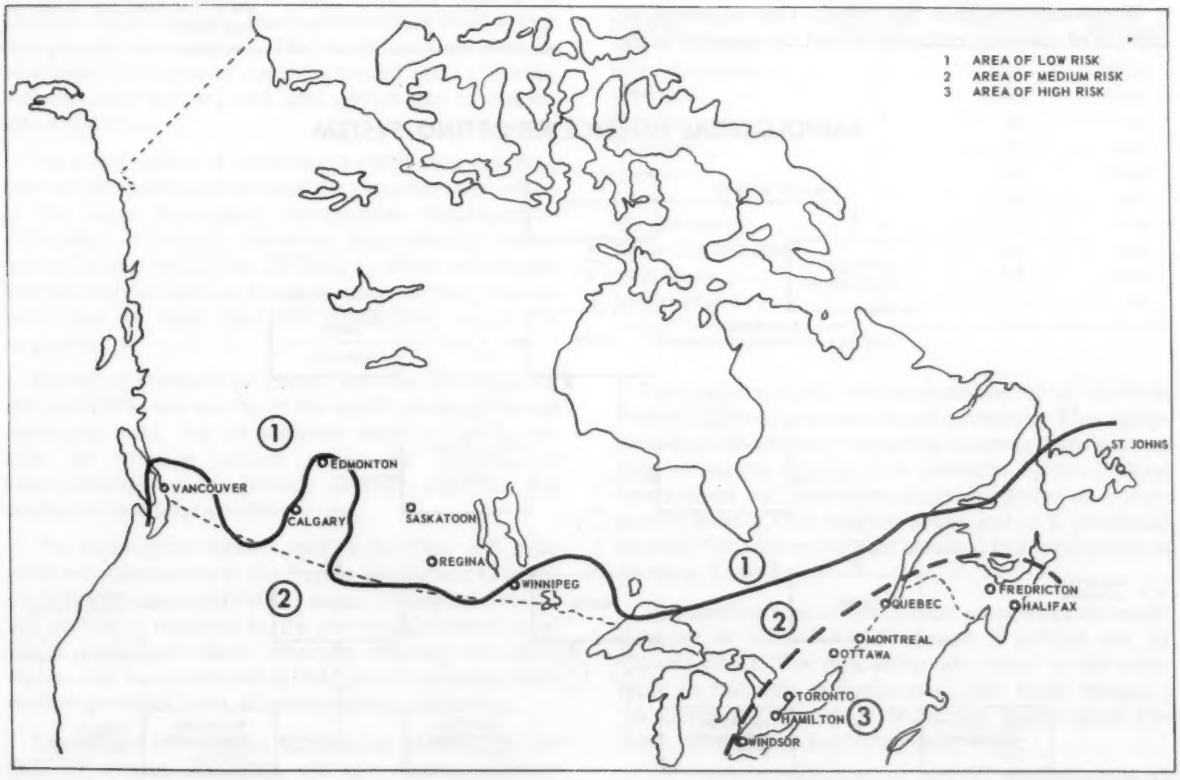
Head, Nuclear, Biological and Chemical Defence Section.

Dr. Lauriston Taylor, Chairman of the National Radiation Protection Council, at the recent International Symposium on "Protection for the Public against Nuclear Radiation" held at Interlaken, Switzerland, said "The period for sheer survival may extend up to three years after an attack. It is during this period that there will have to be many decisions in which the radiological aspects of the problem will be the major ones".

Students of nuclear weapons effects and readers of this publication will be aware of the hazards from radioactive fallout following the surface detonation of a nuclear weapon. However, the extent of this hazard, its effects upon humans, livestock and food, mainly agricultural, is not well known. The author will therefore describe the phenomenon of residual radiation, or fallout as it is more commonly called, and describe the planning, organization, procedures and training required for implementation of an effective Radiological Defence System.

Radioactive debris or particles which give off alpha, beta or gamma radiation following the detonation of a nuclear weapon on the earth's surface will be spread over many thousands of square miles. The particles which give off alpha and beta radiation are not considered in this article as their effectiveness is greatly overshadowed by the effect of gamma radiation. Gamma radiation can penetrate distances of over two thousand yards in air and is only partially stopped by mass thickness. However, sufficient quantities of mass thickness will reduce the efficiency of the gamma rays so as to make them virtually ineffective. It follows, therefore, that shelters of certain types and dimensions are essential for protection against the fallout threat.

Following the detonation of thermonuclear device in the Pacific Ocean in 1954 radioactive debris of significant hazard, covered an area of 7,000 square miles. Fallout extended far beyond this area but in quantities in-



sufficient to cause any immediate hazard to the population.

The fallout risk study map shown at Figure I is the current emergency planning map used in Canada. The map which shows the areas wherein some degree of population control is required, was prepared by the Defence Research Board and indicates three relative risk areas.

South of the dotted line Risk Area Three, there is a one in five chance that the entire population would have to be STRICTLY controlled to ensure survival. The total exposure dose in the open will exceed 75 roentgens in six weeks.

In the area between the dotted line and the continuous line Risk Area Two, there is a one in five chance that the movement of population would need SOME control; the degree of control increasing as the dotted line is approached. The total exposures dose in the open will be less than 750 roentgens but greater than 100 roentgens in six weeks.

The area north of the continuous line Risk Area One, the probability of need for ANY control is less than one in five as the total exposure dose in the open will be less than 100 roentgens in six weeks.

The hazard from radiation at the various levels indicated in the foregoing can be assessed from Table 1.

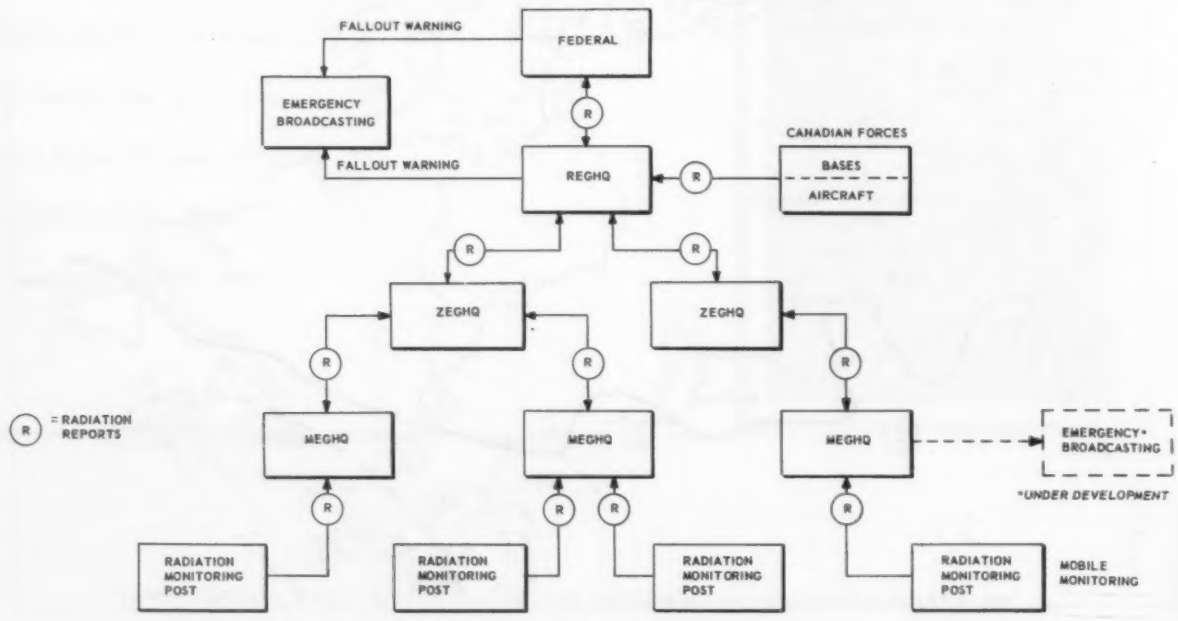
World-wide research has shown that organizations capable of assessing radiation hazard are essential to the conduct of emergency operations in a nuclear war environment. Decision makers of all levels of government need radiological data from which to determine which parts under their jurisdiction, be it municipality, province or nation, must be given priority action, and the time frame in which such action must be carried out.

TABLE 1

RADIATION EFFECTS

Acute Dose in 24 Hours	*Probable effects*
0-150 Roentgens	No acute effect, but genetic changes are certain.
150-250 Roentgens	Nausea and vomitting within 24 hours — minor incapacitation after two days.
250-350 Roentgens	Nausea and vomitting in less than four hours, followed by a symptom-free period lasting from about the third day to the 14th day. A limited number of exposed persons will die at the fourth to sixth week. The remainder will be incapacitated.
350-600 Roentgens	Nausea and vomitting in less than two hours. Death almost certain in the higher dose range in four weeks. Total incapacitation at all times.
600 Roentgens and over.	Nausea, vomitting immediately followed by death in one week.

RADIOLOGICAL DEFENCE REPORTING SYSTEM



To meet these requirements, the provincial/municipal radiological Defence system has been established in Canada. This system, together with the fallout reporting system established by the Department of National Defence, will provide radiological information to all levels of government and to all departments and agencies of the various emergency governments requiring it.

The provincial/municipal radiological defence system normally referred to as the RADEF system will gather raw radiation data from radiation monitoring posts. The data will be processed by trained staffs and acted upon or passed to higher authority for decision. The combined organization and functions of the Department of National Defence and civilian components of the system are shown at Figure II.

The basic requirement of a RADEF system is the provision of radiation information. This is provided by 12,000 monitoring posts. Personnel selected by provinces and municipalities to man these posts are volunteers such as public employees who are willing to undertake this vital emergency measures function in a nuclear war. Radiation monitors are required to be positioned according to pre-determined patterns to ensure adequate coverage of both the densely populated and sparsely populated areas of Canada. They are to be located in protected basements or structures and provided with the necessary monitoring and communications equipment.

Monitors report radiation data into the Municipal Emergency Government Headquarters (MEGHQ) where it is plotted and analysed. The results are then used to determine the degree of control required and to provide data on which industry and local service may base post-attack activities.

The coordination of activities in emergency planning between the municipalities and the province takes place at the Zone Emergency Government Headquarters (ZEGHQ). It follows, therefore, that radiation information is required at the ZEGHQ to allow meaningful coordinated decisions to be taken and emergency actions prescribed for more than one municipality or over a large area.

Radiation information passed into the ZEGHQs by the MEGHQs will not be in the detail necessary at the municipal level, but in sufficient detail so as to enable the decision makers within the ZEGHQ to reach conclusions and provide direction regarding the conduct of operations within the one.

The radiological defence staff in the Zone will relay radiation information to the Region Emergency Government Headquaters (REGHQ) where a complete provincial picture is required by the provincial/federal operations controllers. Here, measures effecting the entire region may be considered in the light of radiation information provided from all muncipalities and zones.

In addition to radiation information provided by the RADEF system, REGHQs will also receive radiation data from the DND fallout reporting system. Here integrated military and civilian staff will analyse the complete radiation input and provide scientific — and technical advice to decision makers at this level.

An organization of this magnitude which embraces the entire country requires the training of large numbers of scientists and technicians. Radiological Scientific Officers are selected by the provinces from officers having scientific backgrounds. They are trained at the Canadian Emergency Measures College on special weapons effects, radiological hazards, radiation analysis and techniques. About 600 Radiological Scientific Officers are required to man Central, Region, Zone and larger Municipal Headquarters. In support of Radiological Scientific Officers, about 1,200 Radiological Defence Officers are required. The majority of these are trained at the Canadian Emergency Measures College; however, some provinces have trained a number of RDOs.

The analysed data is plotted by radiation plotters and analysts. These personnel, the monitors and monitor instructors are trained to a common standard at the municipal level by the province concerned. The total national capability in terms of persons trained is shown at Table 2.

TABLE 2

RADEF PERSONNEL TRAINED

Province	Radiological Scientific	Radiological Defence	Monitors
British Columbia	35	210	1018
Alberta	7	140	1250
Saskatchewan	6	8	16
Manitoba	5	51	646
Ontario	31	26	1800*
Quebec	4	30	363
New Brunswick	4	7	118
Prince Edward Island	2	13	200
Nova Scotia	5	29	1036
Newfoundland	1	3	30

*Monitors other Services 2000

Equipment essential for the measurement of radiation hazard has been procured by all provinces. This equipment is gamma survey monitoring equipment and gamma dose measuring devices. It is procured by the Federal Government and distributed to the provinces on a cost-sharing basis of 75% federal funding and 25% provincial funding. The total equipment obtained by the provinces is shown at Table 3.

The development of operational procedures for establishment of total RADEF system is carried out by Canada EMO. The procedures are issued to the provinces in bulletins and manuals. The latest manual – "A Guide for Provincial/Municipal Radiological Defence System" was issued in April, 1968.

(*Continued on page 16*) **RADIOLOGICAL**

ON REORGANIZING AFTER NUCLEAR ATTACK

by

William M. Brown

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With the kind permission of the author and the RAND Corporation the complete paper will be published in two parts, Chapters I and II in this edition, Chapters III, IV and References in the edition for December-January.

Comment by Scientific Adviser Canada Emergency Measures Organization

Dr. W. M. Brown of RAND is a strong advocate of "Civil Emergency Planning" as a sure-benefit defence measure in a continental attack situation. He was one of the first to advocate crisis oriented emergency planning — a principle which is now recognized.

Dr. Brown now shows that systems-collapse and loss of national control may be the major threat from total war rather than direct effects deaths and destruction. He stresses the absolute need for central control and direction during recovery and shows that realistic defence planning must be a priority peacetime function in many parts and at many levels of the national structure of government.

Dr. Brown makes a strong case for the complete entity and close coordination of a single, clearly defined civil emergency planning defence programme with the ability to move quickly in maintaining national control.

Preface

Research during the past six years on the damage limiting potential of civilian and military defense systems has brought about a drastic change in my view of the threat of nuclear attacks against the United States. This research has led me to the conclusion that highly effective civil defense systems can be designed and programmed with an astonishing cost-effectiveness and, for most of the kinds of nuclear conflicts which are now being anticipated, would have the potential for keeping civilian fatalities *very low* – that is, of the order of a few million or less, possibly much less. Justification for this view is offered in References 1 and 2.

However, if the population survives a nuclear attack which destroys or severely damages hundreds of U.S. cities (including all the major ones), can the United States then recover in a meaningful sense and within a reasonable time (say, 10-20 years)? In pursuing this question, it appeared that there might be a special vulnerability in the social structure which would cast doubt on many recovery estimates – a vulnerability which is related not to physical assets but to organizational problems. This vulnerability is examined in this paper and is found to constitute a major threat – but a threat which might be substantially reduced by appropriate countermeasures. In many scenarios these countermeasures could be implemented during a crisis by coordinated action of a mobilized population – but at this time the effectiveness of such a program cannot be accepted with high confidence.

This paper in somewhat different form but with essentially the same major concepts was briefed in November 1967 at RAND's current Strategic Seminar series and previously at an N.A.S. symposium on Postattack Recovery. The original research was done at the Hudson Institute and has been submitted to the Office of Civil Defense in a paper entitled, "Emergency Mobilization for Postattack Reorganization" (HI-874-RR, draft).

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Chapter I. A Perspective for Postattack Research

A. Spasm Wars and Civil Defence

It may be useful to examine some of the conceptual approaches to PA research with the assistance of Figure 1. *Part A* of this figure shows a time-scale for contemplating CD problems broken into the three intervals: peace, war, and recovery. From 1945 to approximately 1960 most analysis of CD problems was pursued within

this framework which assumes that a nuclear attack would be a strike-out-of-the-blue and would allow only from minutes, to possibly several hours, before any region experienced hazards of the nuclear attack. This concept establishes a preconception that, for nearly any aspect of survival or recovery, any countermeasures must be taken during times of peace.

Even assuming the validity of Figure 1-A practical difficulties arise. The large sums required for effective CD systems (billions) have not been obtainable and probably will not soon be.

B. Deferred-Cost CD Programs

In the late 1950s, some analysts began to examine cases in which a war was preceded by a period of international tension (Figure 1-B). This possibility seemed to have a number of military consequences. As more studies began to consider this alternative, the notion became increasingly widespread that nuclear war preceded by crisis was not only "not unreasonable" but might be much more probable than a "sudden" war (Figure 1-A). It has since been argued that if a choice is necessary, Figure 1-B should replace Figure 1-A as the standard

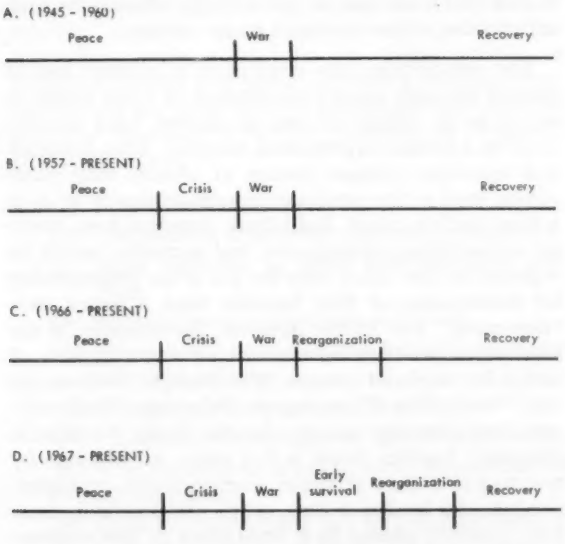


Figure 1

basis for defense planning.[1] This perspective has persisted up to the present and has won wide acceptance among strategists, although in some studies not much more than lip service seems to be given to the concept while the analysis mainly proceeds on the basis of Figure 1-A.

For CD, the acceptance of a crisis period as a basis for research and planning complicates the picture by introducing many new response options. However, as a positive aspect, it enables analysts and planners to see a potential for designing low-cost systems which may enable nearly all the U.S. population to survive a nuclear attack.[2] Even survival in the 95-99% range does not now seem a ridiculous outcome for attacks in which a few thousand megatons are directed against urban centers. In addition, and of most importance for this paper, the visualization of Figure 1-B opens new ways to think about effective recovery planning.

The basic notion is that the systems for survival and recovery need not necessarily be built during peacetime. Figure 1-B implies that plans might be made in peacetime for a general emergency mobilization of the population which, during the crisis interval, could provide the labor and material resources to build rapidly the CD system. Presumably, a reasonable portion of effort during this interval would be allocated to phasing in measures which would improve our ability to recover.[3] A tantalizing aspect of this concept is that it introduces the possibility of deferring to the time of need (when, presumably, funds would be readily available) the major costs of systems which, if built in peacetime, might cost tens of billions of dollars.*

The argument is that at the present time CD seems to have little choice, if it is to obtain a highly effective defense, but to adopt a deferred-cost plan based upon rapid mobilization of the skills and physical resources of the nation. Thus, not unreasonably, it would seem, a next logical step in the development of CD would be to add a capability, through preplanning, to phase in an emergency mobilization of the population in response to a future nuclear emergency.

C. Postattack Reorganization Period

Creeping into current PA research is the orientation shown in Figure 1-C. The main point is the introduction of the *reorganization* period.

Some previous studies of recovery have concentrated on the reorganization required in a single "institution" (government, petroleum, steel). Generally it has been concluded that none of the problems are insurmountable, and that usually special preparations can be made which would speed up the recovery. However, what may be valid if problems are handled singly may be false if many problems must be solved simultaneously. For example, it is usually *assumed* (implicitly!) in such studies that (a) the government is intact, (b) money and inflation problems are not important, (c) credit is available, (d) prices and wages have been settled, etc., etc.

Although going from Figure 1-A to Figure 1-B gave us a framework with a greater potential for solving some

*Of course the costs at the time of need may be greater than those involved in the construction of a peacetime system. Whether the system would be more or less effective than one constructed in peacetime would depend upon the factor of obsolescence and the specific war outbreak scenario under which the system would be "tested."

survival and recovery problems, the concept of Figure 1-C further complicates the postattack picture by emphasizing the need to worry about the reorganization phase. We find it conceptually distinct from any study of recovery which *assumes* that the survivors can function effectively without having to solve some basic organizational problems first. It will be argued that reorganization problems precede and often would dominate the question of PA economic viability. If this is correct it should follow that these problems deserve high priority in future PA research.

It should be apparent that the effective functioning of *long-term* recovery plans would first require that the economic reorganization has been effectively accomplished, certainly to the extent that (a) certain elements of the federal government have been restored; (b) that a functioning money system exists; and (c) that the manpower can be obtained for the implementation of the emergency government functions. Subsequent discussion will claim that these conditions may be difficult to meet in some environments and that if they are not met a major PA threat would exist.

Chapter II. Postattack Societal Problems

One worry is that while there may not be sufficient survivors or capital for recovery to take place readily (i.e., a potentially viable economy in Winters' terms).[4] Perhaps the social disorganization would prevent the effective use of the remaining assets and society would disintegrate by losing its "identity."

We will attempt to define this potential threat to PA society by presenting a number of allegories or metaphors. Hopefully, this approach will add some clarity, improve our perspective, and thereby help decide whether this matter deserves increased emphasis in future research.

A. Environmental Shock and Personal Identity

The structure of human personality may be defined by the continual reinforcement of its identity through daily experiences. That is, by frequent interaction one comes to believe certain people to be friends, acquaintances, or enemies; he knows what work he can or does perform by his employment, hobbies, and chores; he knows humor by the events that amuse or entertain him and others. Without conscious thought he "knows" many of his functional roles, such as father, husband, gardener, accountant, commuter, skier, Catholic, Republican, neighbor, driver, voter. . . . Each of the major roles themselves break down into a set of functions. Thus, without having to think, it is important to know how to get breakfast, how to respond to routine questions, how to fill out forms, how to drive an automobile, how to go to work, how to react to a greeting, what a buzz on the intercom means, how to buy supplies for work and home, what to expect in a restaurant, or theater. . . . Thus there are thousands of daily functions by which an individual establishes his current identity. These functions are supplemented by the simple recognition through the senses of a house, lawn, mountain, tree, river, road, person, typewriter, violin, fire, perfume, etc. – all of which help remind us of who we are. The point we are trying to illustrate is that in a major sense, while always changing, a person's current *identity* is established by a frequent sensory reinforcement of his past experiences.

Therefore, it is not surprising to find that many, if not most or all, persons who are subject to various unusual sensory experience (for example, natural disaster, sensory deprivation, drugs) will experience a partial, in some cases nearly total, change in personality which we may call *loss of identity* if it occurs suddenly. This effect in clinical or medical jargon is expressed as "depersonalization," psychotic break, hallucinatory experiences, etc. Sensory deprivation and drug experiments have shown that some people are strongly affected by such experiences; others are much more resistant.

For our purpose, this description of possible loss of identity through sensory deprivation or other means is meant to be allegorical and to express what we fear could be a parallel in postattack recovery. Thus, a sudden and somewhat massive change of *identity* may occur among most of the surviving population during or after a large nuclear attack. Individuals removed from familiar surroundings, employment, and recreation would be deprived of their usual roles but not of the responsibility for maintenance of their families. Such a person may "degenerate" into listless behavior, for example, of the kind which has often been associated with occupants of camps for displaced persons. (For example, in Germany after World War II, among the Palestinian-Arab refugees, and currently among relocated South Vietnamese villagers.) Another threat is that many would adapt by reverting to a more primitive, uncooperative, or aggressive behavior leading to riots, gangs, and general lawlessness, possibly leading to a breakdown of law enforcement in many areas – if not the whole country.

B. Institutional Identity

The identity of an institution, like that of an individual, is generally slowly changing and thus can usually be easily recognized over short periods of time, months, or years. The identity is composed of such things as financial assets and liabilities, employees, buildings and locations, products and services, management, internal procedures, and its traditional relationships with other institutions which establish reasonable expectations for credit, sales, purchases, etc. The expectation that change

in *any* of these important aspects will not take place too suddenly or too massively for a reasonable adjustment to occur is important to the preservation of its identity. Thus, if employment changes very rapidly, shock waves travel through the institution and threaten injury. An institution can be shocked by a sudden change in sales when war or peace breaks out or an economic unexpected recession develops. If one large firm goes bankrupt, others related to it may fall like dominoes. Certainly a single massive or sudden change can and often has "killed" an institution. Some are so fragile that they are not even adaptable to the ordinary slow changes of peacetime. (In 1965 about 13,000 economic firms went bankrupt in the United States.)

We are going to ask what may happen to institutional identity under the impact of a nuclear attack and what the implications are for postattack society. As the reader may suspect under many conditions the "answers" may appear to be very grim. At least in the word picture to be presented the *grimness will be deliberately emphasized* in order to stimulate reflection on the threat.

The PA institutional identity will be affected by what we may term its tangible and its intangible vulnerabilities. The tangible ones include (a) physical damage, (b) loss of personnel, (c) loss of demand for its product or services, (d) unbalance in supplies, fuel, or utilities. The intangible problems tend to be socio-economic or politico-economic and *affect institutions* whether damaged or not, and could have a much greater impact on the ability of the nation to recover. They may be composed of such matters as:

(1) Loss of credit or solvency
(2) Confusion as to property rights among survivors
(3) Legal problems of debts and unfulfilled contracts
(4) Meaningless wage contracts or salaries
(5) "Temporary" collapse of the federal government or federal authority.
(6) "Temporary" suspension of banking
(7) "Temporary" suspension of the judicial systems
(8) Wild fluctuations in prices, rents, or expectations of future prices
(9) Civil disorder arising out of spurious distribution of surviving supplies (and/or surviving capital)
(10) Socio-political and economic uncertainties compounded by rumours and local breakdowns in law and order.

C. Postattack Scenario

This section offers a more specific image of the reorganization problem by presenting a brief postattack scenario. This scenario assumes that no special countermeasures were taken before the attack. It deliberately emphasizes many dire developments which cannot logically be excluded in order to attempt to "feel out" a few horrible, but not impossible, postattack outcomes.

We focus upon a small textile mill in "Parville," an undamaged Tennessee town: preattack population about 40,000; postattack population about 150,000. The attack against cities was about 2,000-MT. Most city people are assumed to have survived through an emergency evacuation and the use of improvised fallout shelters. Four weeks after the attack (late summer) the following situation prevails:

1. *Uncertainty about Present and Future:*

It is not clear whether fighting will resume. The federal government is a shambles. Washington, D.C. is destroyed. Little provision had been made for emergency postattack operations by the federal agencies.

2. *Radiation Threat:*

The fallout threat is under control. Most people have left areas of intense radiation. There is confusion and some hysteria about radiation poisoning, but most people have learned to estimate the threat and are not frightened by low levels of radiation.

3. *Presidential Rumors:*

The President (and Cabinet) survived in an emergency shelter but his current location is not known. Various rumors claim he has been killed, murdered, imprisoned, committed, hospitalized, emigrated, etc. Actually, the President has been silent because he believes there is a high probability that knowledge of his whereabouts might bring another Soviet weapon on the United States, aimed at him since the S.U. Premier was killed in Moscow.

4. *Food:*

There are severe food shortages in many localities and bartering of labor and supplies for food is becoming widespread. People are generally loath to accept money for goods (especially food) at almost any price. It is widely feared that money is and will be useless. Food hoarding is widespread. Surviving banks remain closed. People without food are forming into "action groups." Rumors flood into every community about the location of food stockpiles (private or public) resulting in treks toward these areas.

5. *Civil Servants:*

It is difficult for the surviving remnants of the government agencies to get their personnel back since they have no current means for paying them except by checks – in the old (now nearly worthless) currency. Most of their employees are out looking for food and supplies and would be difficult to find, even if someone

tried. No solid information exists about when or whether a functioning federal government can be reconstituted. In Parville few city employees have returned to their former jobs – not even the police.

6. *Early Riots:*

About 50,000 people arrive at Parville, between September 15 and September 30 looking for nonexisting food stockpiles. Friction develops between these people, many of whom now believe the residents have already hoarded the stockpiles in secret caches. Riots develop during October 1 and 2, in which a thousand people are injured and three hundred buildings and homes destroyed by fire. The rival groups improvise internal organizations for action and self-protection. Because of time pressure and hostility, effective communications between them is almost impossible. Appeals for state and federal intervention are unheeded because the remnants of government are already overwhelmed by an avalanche of other urgent tasks. The resolution of the local conflict finally comes through a dispersal of both groups to other areas in search of food.

7. *Managerial Problems:*

The owner of the mill contemplates his problems in trying to restart production. He finds:

(a) many of his former employees cannot be located;

(b) there is much labor available but no one will work for money (a gallon of gasoline trades for about $50 and a can of corn for $70);

(c) the banks are closed and no one knows when or if they will open or even what the banks' business will be if they do open;

(d) he has no useful idea of what factory supplies can be obtained, or when, or how much they may cost, or even what "cost" means;

(e) he has no sales for his merchandise nor any reasonable way of getting any soon, at least that he is aware of. Besides he would not know what to charge for any of the mill's products if he were asked;

(f) he does not know whether he will be solvent or bankrupt when a new balance sheet can be calculated if it even can. Thus, he reasons, any firm that might attempt to deal with him may be similarly unreliable. Certainly credit cannot be extended – nor could he expect to get any – even if stable prices developed, for which he sees little hope;

(g) to help resolve his dilemma, he looks to the local C of C, which in turn looks to the town government, which looks to the country, which looks to the state, which looks to the federal, which is not functioning effectively and some fear is threatened, with imminent collapse.

8. *Food Distribution:*

Although there is no overall food shortage in the country because of extreme problems in distribution, aggravated by a nearly universal tendency to hoard, food stocks have disappeared from usual wholesale and retail distributors. Where feasible, people flock to the farming districts to obtain whatever food they can, which is then either hoarded or bartered.

Because of a shortage of gasoline for transport, there is a huge demand for bicycles, wagons, carts, and beasts of burden for which animal feed is locally available. The farmers are complaining that shortages of gasoline are threatening their capability to harvest, plant, and fertilize. Some are predicting that the next year's crop may be a disaster because of this threat and some shortages of pesticides and fertilizers. Also about half the crop land is considered too radioactive to farm for the next several months.

9. *Some Federal Problems:*

Economists agree on the need to re-establish confidence in federal money – that is, to create an expectation of stable and reasonable prices for goods. But there is no agreement on how to bring this about in time. The federal government has been losing its remaining authority rapidly. Rumors abound about currency reform, banks, damage compensation, welfare, starvation, renewed enemy attacks, epidemics, and bacteriological warfare. The government is blamed for the lack of preattack preparations, for getting into a nuclear war, for their current incapacitation, and for hoarding food.

10. *Military Dilemmas:*

The armed services are threatened with disintegration since their normal channels for supplies have been disrupted and it is not clear how these can be reconstituted. Factories producing munitions are closed, food suppliers are not operating, and teamsters will not work for their preattack contractual wage, if there were goods to transport. (Besides there have been reports about extensive hijacking.)

In addition, most servicemen are worried about their families and are requesting leave (even though transportation is uncertain). They are also grumbling because their pay has become meaningless. The armed services are afraid that if the men do leave, they won't get them back and if they don't leave that they won't be able to feed them.

11. *Changing Values:*

Law enforcement, preattack style, has become meaningless in most areas. Local police in food-rich communities help defend the status quo against out-

(*Continued on inside back cover*) **REORGANIZING**

NOVA SCOTIA EMERGENCY PLANNING

by

Gordon Grant, Director
Emergency Measures Organization (Nova Scotia)

Two major explosions and the close involvement in two world wars has inpressed upon Nova Scotians the necessity of planning for both peacetime and wartime emergencies.

On a cold December day in 1917 two ships collided in Halifax Harbor setting off an explosion unequalled in size and devastation until the Atomic bomb was exploded about a quarter of a century later.

The 1917 catastrophe, which killed or injured thousands and levelled entire sections of Halifax and neighboring Dartmouth, was followed in the Second World War by the less destructive Bedford naval magazine explosion, which, however, caused mass evacuation of a large proportion of the population of Halifax.

The destruction and hardship these two explosions and the inadequate planning for coping with the injured and the homeless, were very much in the minds of provincial and municipal officials when organized emergency planning in the province in the 1950's was initiated.

In one sense the province has been fortunate over the years in that it has not been subject to any significant number of emergencies like the two previously mentioned; but despite the infrequent occurrence of such catastrophes, emergencies of lesser dimensions have occurred and we have to be prepared to cope with them where and when they develop.

In recent years there have been several major emergencies in which Emergency Measures Organization (N.S.) has been involved, including the 1958 mine disaster at Springhill and wide spread forest fires in 1960 and 1967.

This year marks the 10th anniversary of the passing of legislation authorizing the organization of full-time emergency planning as a provincial responsibility.

The Province incorporated into the program the basic principles of emergency planning: the survival of the population, continuity of government and conservation of resources.

Civil emergency planning in Nova Scotia began in earnest with the promulgation by the province of the Civil Defence Act dated May 3, 1958. Prior to this enactment there had been sporadic attempts at emergency planning. An emergency control centre had been built at Waverley, near Halifax; and several municipalities had made sincere efforts to organize for civil defence. However, there was little total organized activity as is known today.

The Nova Scotia act of 1958 had given the provincial government wide powers to act in an emergency and some of these powers were delegated to any municipality which had passed relevant by-laws and had formed a local civil defence organization. When the federal government passed the Civil Defence Order of 1959, a great deal more serious provincial thought was given to responsibilities and the concept of modern civil emergency planning became a fact.

The provincial staff for civil defence was deeply engaged with the numerous training courses that were being held and the province was divided into three zones (Western, Central and Cape Breton) for the betterment of administrative problems. Each of these zones was the responsibility of a zone controller who was a full-time provincial employee reporting directly to the co-ordinator of civil defence in Halifax. This type of control was found to work very efficiently and is still in effect.

At this time the co-ordinator was given the responsibility of forming a committee composed of deputy ministers to plan continuity of government.

This committee arrangement continued until the Cuban crisis of October, 1962. At that time it was decided to change the name of civil defence to Emergency Measures Organization (N.S.) and at the same time to split the responsibilities. The co-ordinator (the title has since been changed to director) and permanent staff was given the title of "Operations Branch" and made responsible for training and administration.

A new Continuity of Government Planning Branch was formed under the chairmanship of the Administrative Assistant to the Premier. With reorganization the Premier issued a directive that each government department with a first-line responsibility in case of a nuclear attack would make a plan for continuity of government for his department and submit it to the branch. Authority for this is contained in an act to amend the Civil Defence Act given assent on March 18, 1964.

In 1966 when the work load carried by the chairman of the continuity planning committee became too heavy, another change was made.

At this time the Premier issued another directive in which each first-line department must have a planning officer who will keep his departmental plans up-to-date and who is responsible for selecting and depositing the essential records in Regional Emergency Government Headquarters.

Statement by Hon. Percy Gaum
Minister-in-Charge of Emergency
Measures Organization (N.S.)

The role of emergency planning at the several levels of government is changing with the times and for those of us involved in planning and implementing EMO programs this is an essential point to remember.

In Nova Scotia we have built into our training program this concept of continuous change in an effort to keep our overall program as effective as possible.

Fortunately for Nova Scotia, and unlike some other provinces, we are not subject to such disasters as hurricanes or floods. However, our training programs do emphasize the necessity of being prepared to cope with these and other natural, as well as national, emergencies.

There are emergencies in which EMO (N.S.) does become involved, however, including the recent forest fire in the Cabot Trail area of Cape Breton in which EMO volunteers and equipment were requested to assist in combating the fire that destroyed more than 50 square miles of heavily-wooded forests.

The Cabot Trail call-out pointed up the flexible nature of our training programs, especially emergency feeding, and the speed with which we can become operational.

In the training year recently completed a total of 16 courses were held in various centres of our three zones; between 1962 and 1967, for example 7,567 Nova Scotians received instruction in one or more fields of emergency planning thus ensuring a strong nucleus of well-trained volunteers.

"Although the financial limitations have forced us to reduce the number of courses we can offer this year we will continue to emphasize the quality of training in our program to provide the best civil protection possible for the province."

In the same directive the chairmanship formerly held in the Premier's office was given back to the director of EMO (N.S.) and continuity of provincial government planning is the responsibility of EMO (N.S.) with the assistance of departmental planning officers.

The years of greatest growth in EMO (N.S.) were 1962-67 when the number of municipalities actively participating in EMO increased ten-fold to a record 63 out of a total of 66 municipal units.

Between 1962-67, 7,500 Nova Scotians received training in one or more training courses essential to communities in the event of a national or natural emergency. In addition to these, 780 received advanced training at Canadian Emergency Measures College, Arnprior, Ontario. Many of those trained were municipal officials.

With the change in the international situation in the last several years the organization has kept training programs flexible as possible to meet any situation that might arise.

The concept of continuous change is a basic requirement in overall provincial planning.

At present main training activitiese are concentrated on Auxiliary Police, RRO, Rescue, radiological defence and Emergency Health Service.

RADEF takes up most of the time of one of our senior staff members and the positioning of RADEF instruments is well under way. Emergency Heath Services has almost completed its prepositioning program of medical supplies and equipment.

A series of courses have been and are continuing to be held to show municipalities the proper manner in which to staff and operate their Municipal Emergency Government Headquarters.

Although the main planning by the three levels of government in the province is directed toward wartime emergencies it was considered desirable that planning for peacetime disasters should be started and co-ordinated.

Following this decision, the Provincial Disaster Committee was formed to deal with peacetime disasters of magnitude. It is composed of representatives from the Red Cross, St. John Ambulance, Salvation Army, Royal Canadian Legion, Canadian Coast Guard, the Provincial Fire Marshal, R.C.M.P., Atlantic Region Canadian Forces observers from "H" Division, the Regional Director of Canada Emergency Measures Organization, and the Federal Representative, Emergency Welfare Services, the Chairman of this Committee is the Director of EMO (N.S.).

The terms of reference for this committee are very flexible as its main responsibility is the co-ordination of the various services concerned. This co-ordination is extremely important as it had been found that, in the past, conflicts of interest had to be dealt with unsatisfactorily on a piecemeal basis. Sound planning principles and application have eliminated the problems formerly responded to be devisive measures. ▲

CANADA EMERGENCY MEASURES ORGANIZATION BLAST TESTS

by

Mr. W. A. Johnston

Acting Head, Blast Protection Section, Canada E.M.O.

As a participant in field trials at the Defence Research Establishment, Suffield, Alberta, over the last five years the Canada Emergency Measures Organization's program of research in blast protection has been a beneficiary of the work done at or by Defence Research Establishment, Suffield. The "EMO National Digest", October, 1964, reported on tests being conducted on blast shelters and blast valves. Since that time improved designs for blast shelters, blast valves and other hardware have been developed and tested in field trials, including the 1968 operation "Prairie Flat" 500 ton detonation.

Blast Protection Program

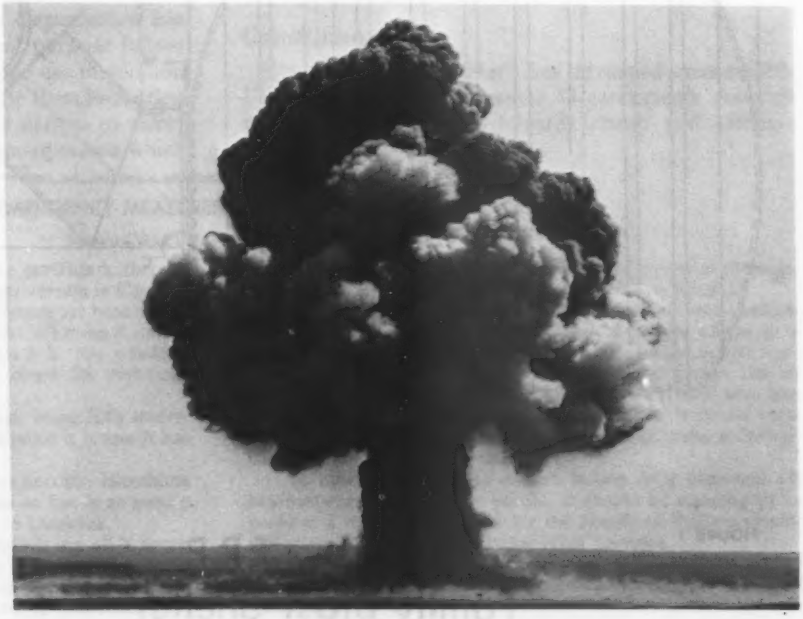
Past experience has suggested that the cost of blast protection is impractically high. The first activity in this program must, therefore, be to develop techniques for blast protection with sufficiently low costs so that blast protection can be considered as a real option in government planning. Only then can meaningful cost-benefit data be prepared for consideration by responsible authorities.

The Blast Protection program of Canada Emergency Measures Organization has as its objective the production and development of cost effectiveness data on which a policy related to the protection of the civilian population against blast and associated effects of nuclear weapons may be based.

Work in this area has been carried out to develop a family blast shelter and a communal blast shelter with associated components. Portions of both of these activities were tested this year in Operation "Prairie Flat".

Family Blast Shelters

In 1964 the Mark I fibreglass reinforced plastic blast shelter was tested at Suffield. This shelter was cylindrical in shape with heavy circumferential ribs of reinforced plastic. Tests indicated that this design was unnecessarily strong and too expensive. The current Mark II fibreglass reinforced plastic blast shelter was developed from this experience. The Mark II shelter has small reinforced plastic ribs on a filament-wound cylindrical body 8 feet in diameter and 10 feet long. Eight shelters were built and tested at Suffield in 1966 with short duration blasts from detonations of 20 tons of T.N.T., again this year in Operation "Prairie Flat" under 50 pounds per square inch pressures at greater distances. Four of the shelters were installed three feet below the surface of the soil with the longitudinal axis horizontal as shown in Figure 1. As a result of this year's blast serious damage occurred in the latter four shelters but the four shelters buried completely below ground surface suffered only minor damage. Operation "Prairie Flat" proved that this shelter underground is an acceptable economic structural form for a family blast shelter.



On August 9, 1968 at 11 a.m. local time, 500 tons of T.N.T. were detonated at the Defence Research Establishment, Suffield, Alberta.

This test named Operation "Prairie Flat" was the latest and most successful in Suffield's continuing program of theoretical and applied research on blast phenomena and effects.

Participants in the trial included Defence Research Board of Canada, Canadian Forces, agencies of the Governments of Great Britain and the United States of America, several commercial firms and the Canada Emergency Measures Organization.

Hatch Covers

The entrance to the shelter is through a hatchway as shown in Figure 1 which is closed by a fibreglass reinforced hatch cover. Hatch covers were tested at 50 lbs. per square inch and higher and were shown to be able to survive the same pressure values as the buried shelters.

The effect of blast on a target is a function of overpressure level and the duration of the blast wave. The duration of the blast wave depends on the amount of energy producing the blast. In general, for a given overpressure level the longer the duration of the blast wave the more damage will be done. Because of this pressure time phenomena, a test with 500 tons of T.N.T. is more meaningful in testing than a test of 20 tons of T.N.T. even though the target is exposed to the same peak overpressure. In relating the results of this test to the performance of shelters against nuclear weapons one must reflect that the duration of a nuclear blast is much longer than the duration of the blast from 500 tons of T.N.T. The Mark II shelter and hatchcover which have resisted the 50 lbs. per square inch from 500 tons of T.N.T. will resist about 30 lbs. per square inch from a nuclear weapon. These designs will survive even in some area where all commercial structures and residences are destroyed.

Blast Valves

A serious problem in blast shelter ventilation is the passage of the blast wave through ventilation ducts into the shelter. It is quite easy to install a pair of heavy valves to stop the blast wave. However, since one cannot predict when the blast will take place, it is not possible to know when the valve should be closed. In the field trials of 1964 the Canada Emergency Measures Organization tested a blast valve which closed automatically when triggered by the blast wave. This valve incorporated expensive carefully machined moving parts. A search was made for a simpler valve form preferably with no moving parts. The Canada EMO bead blast valve is an adaptation of sand filters used in the Second World War to attenuate shock waves. The valve, illustrated in Figure 2, consists of a chamber filled with glass beads 0.125 inches in diameter. Air at normal velocities flows around the beads without difficulty while high velocity of the

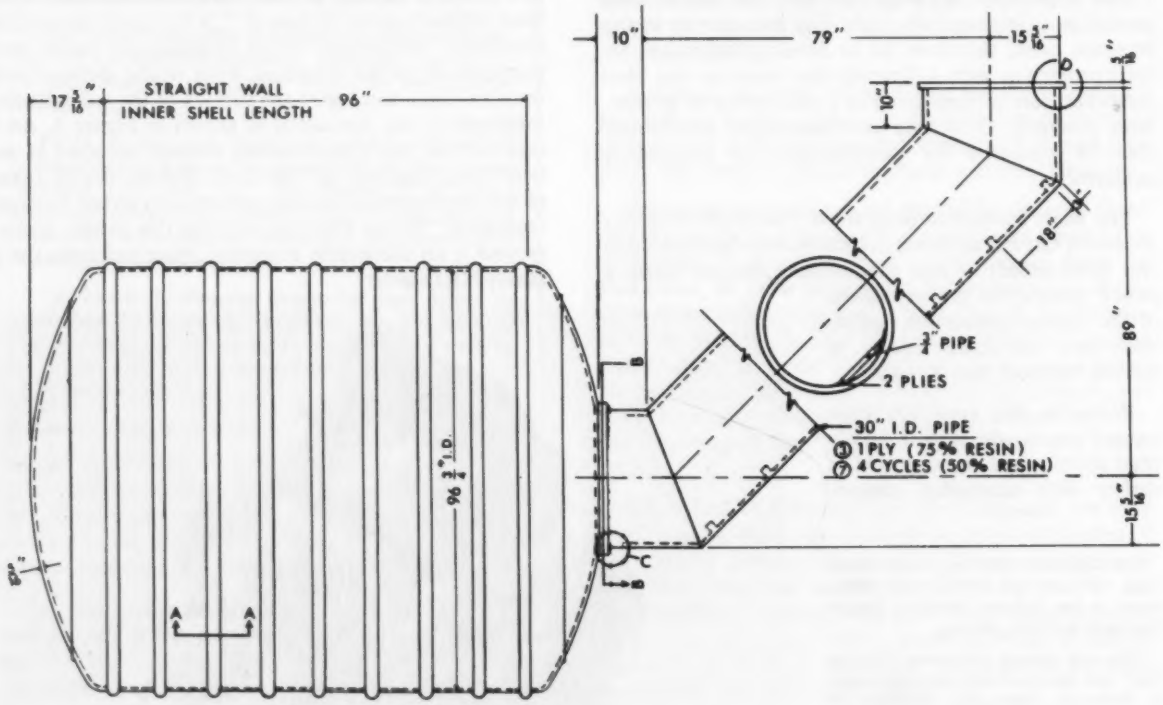
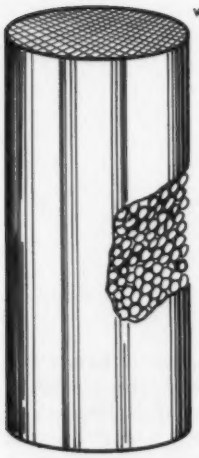


FIGURE 1

Mark II F.R.P. Family Blast Shelter



BEAD TYPE BLAST VALVE

FIGURE 2

blast wave produces tremendous turbulence which attenuates the blast wave to acceptable levels. There are no expensive moving parts and since the valve is always open it is possible for the occupants of a shelter to remain in the shelter for hours or days. Operation "Prairie Flat" demonstrated that this valve would attenuate blast waves to a level acceptable for a family shelter.

The Canada Emergency Measures Organization also tested two blast valves for the Norwegian civil defence agency. These valves have moving parts and are designed for the stringent requirements of their communal shelters. Both of these valves operated satisfactorily in Operation "Prairie Flat".

Communal Shelters

The Canada Emergency Measures Organization has developed a series of designs for dual purpose fallout shelters. These designs have a peacetime use in addition to their capability as fallout shelters. The Blast Protection Section has attempted to modify these designs to incorporate blast resistance and to develop components which would be useful in providing blast protection in other similar structures. The most important requirements for communal shelters are, a ventilation system which attenuates the blast wave and a blast resisting door for the shelter. The blast valves previously discussed have been developed so that in larger models they will be effective for communal shelters.

The development of a blast door at reasonable cost has posed serious problems. Blast doors traditionally have been massive structures of steel and/or reinforced concrete designed to resist the full blast load. Recognizing that the duration of the peak overpressure is short, Canada EMO developed a fibreglass reinforced blast door which yields under blast load. Since the deflection of the door takes an amount of time which is of the same order of magnitude as the duration of the peak overpressure, the door does not "feel" the full load. This door has been tested in the shock tubes at DRES and was tested in Operation "Prairie Flat". While the present design is not completely successful it is a promising step in the development of a new type of door which can be produced at a fraction of the cost of designs previously tested.

Shelter Furniture

It is well known that a ground shock is produced by the detonation. Blast shelters which are able to resist the air blast will be subjected to ground motion with high accelerations. To avoid injury to occupants by the motion of the shelter it is necessary to isolate them from it. A system of shock mounted furniture was developed for the single family shelter and tested in the field trials of 1966. This system while satisfactory in function is quite expensive. This year a system using specially designed hammocks on short cords was tested in Operation "Prairie Flat". Analysis of these tests are still being carried out.

Conclusion

Operation "Prairie Flat" has advanced considerably Canada Emergency Measures Organization's research and development work towards cheap and effective civilian blast protection.

EDITORIAL

EMERGENCY MEASURES CAN SERVE LAMBTON

Sarnia Observer — August 7, 1968.

Despite the fatalists, the cynics, and the pettifogers, there is still a valid argument for a civil defence organization in Canada. Because the EMO (Emergency Measures) has never been called on to show its stuff in a national disaster, it doesn't mean it should be abolished. Far from it. However, because it is "low echelon" and almost an orphan, it makes a ready target for ambitious politicians seeking self-aggrandisement.

By virtue of being an "orphan" and not being fully understood by the public, EMO has two strikes against it before it has time to state its case fully.

This week, exactly 23 years after the horrible Hiroshima bomb that killed more than 62,000 persons so far, is as good a time as any to re-assess EMO as it applies to Lambton.

Training, equipment, supplies and payrolls are all a necessary part of EMO. Like the Boy Scouts, the organization operates on the assumption it should be prepared. But where we find legitimate cause for criticism is in EMO's terms of reference. They should be expanded. They should be part and parcel of the community in time of emergency, be it man-made or natural.

We would like to see the EMO dovetailed with welfare agencies, and with police, firemen, and municipal offices to a greater degree so that it could perform a community service that, up to now, is lacking. It should look after the human side of matters, such as the care and accommodation of those who lose their homes and belongings in fires or tornadoes. It should complement, not duplicate, other emergency services, perhaps centralizing manpower and information.

In other words, EMO doesn't belong in a basement. It belongs wherever there are people. It should be standing by to perform a multitude of tasks for the benefit of the community and perhaps pointing the way for other agencies.

If EMO were expanded (a new name wouldn't be amiss) then, we feel sure, its critics would find that its budget was money well spent.

OPERATION WOODBURN 1968

by

Earl Reekie

Director Exercises and Studies Division

Reprinted from the Alberta Emergency Measures Organization publication "Survival" Vol. 4, No. 4, July 1968.

General

The small amount of precipitation during the winter months and the complete lack of rain during the Spring in many of the forest areas, set the stage for the most serious outbreak of forest fires in the history of the Province. At the height of the operations 23, 24 May, some 120 fires were burning with 25 of them out of control.

The bulk of the fires were in the Forestry Protected Area but at one time, some 25 fires were burning in areas adjacent to the Protected Area. Outside of the Protected Area, the responsibility for fighting the fires rests with the County, Municipal or Improvement District authorities. The Department of Lands and Forests were so fully committed that very little assistance could be given to local authorities in the way of equipment and trained forest fires fighters.

Generally the fires were burning in unpopulated areas but some communities were threatened and precautionary measures had to be taken. The Department of Lands and Forests asked the Alberta Emergency Measures Organization to assist in any evacuation and in the care of evacuees. Alberta EMO were also asked to assist municipalities in obtaining heavy equipment for fire fighting.

Organization

An Operations Room was set up at HQ Alberta EMO and a duty roster drawn up for continuous manning by EMO Staff between the hours of 8 a.m. and 11 p.m. As the operations progressed it was found unnecessary to keep an officer on duty after 6 p.m. and any calls were handled by the Operations Officer from his home.

The roster also included an officer on duty with Lands and Forests in an office established for the control of heavy equipment. In response to radio broadcasts an impressive list of the location and availability from non-public sources of bulldozers, low-boys, etc., was built up.

The Officer-in-Charge of the Peace River Zone was moved to the Town of Slave Lake to assist the Forestry Supervisor in any evacuation of threatened communities. He remained at Slave Lake from 23 to 28 May.

Resources

Alberta EMO assisted the Department of Lands and Forests in making arrangements with the Canadian Armed Forces for the use of a building and beds and bedding for a manpower centre which was established in Edmonton. The Canadian Armed Forces also supplied helicopters from Edmonton, Cold Lake and Winnipeg but all arrangements for these were made directly between the Department of Lands and Forests and the Canadian Armed Forces.

Arrangements were made with the Emergency Welfare Services for the use of emergency feeding equipment and blankets. EMO moved 1,000 blankets from storage in the

Smoke billows skyward from a forest fire threatening Slave Lake, Alberta. Canadian Forces Photo.

Regional Office—Wetaskiwin—to Edmonton to be held as a readily available reserve. Two hundred of these blankets and one emergency feeding unit were loaned to the County of Athabasca to be used in their base camp in the Spruce Creek area. In the Town of High Prairie, 500 Emergency Welfare blankets were used for the evacuees from the Faust area.

The Emergency Health Services made available all emergency health equipment and supplies in the Province and made arrangements with Emergency Health Services, Ottawa for additional supplies, if required. Fortunately it was not necessary to provide any emergency health care.

Through the Fire Commissioner's Office the Department of Lands and Forests obtained the use of three fire pumpers from Edmonton for the protection of the Town of Slave Lake and other communities on the south shore of Lesser Slave Lake. Two of these pumpers were from EMO sources. The pumpers were not used but were made available along with two members of the Fire Commissioner's Staff, in Slave Lake from 3:30 a.m. 24 May to 6:00 p.m. 27 May. One additional pumper and 25 men were standing by at the Peace River Jail.

No requests were received from municipalities for heavy equipment and the officer on duty with Lands and Forests equipment control was recalled after 25 May. One request for back-pack tanks, pumps and walkie-talkie sets was received from Athabasca County but all supplies were in use in the Forestry Protected Area.

As a precautionary measure, Lands and Forests obtained the mobile emergency communications network from Alberta Government Telephones and moved it to the Town of Slave Lake. The system was not used.

Evacuation

There was some voluntary evacuation from threatened areas such as the hamlets of Peers and Flatbush but this was unorganized and the number who moved is not known.

On the recommendation of the Forestry Superintendent in Slave Lake, the residents from the area of Faust were evacuated. In seven school buses, 176 people, mostly elderly Indian and Metis and women and children were brought into High Prairie. Most of the evacuees were housed in the Sports Palace but some of the elderly and pregnant women were accommodated in motels and a few went to homes of friends in the town. Feeding was arranged by the Regional Supervisor of Public Welfare in local restaurants.

On 24 May there was some discussion with the Department of Public Welfare on the return of the evacuees but after further consideration and on the advice of the Forestry Superintendent in Slave Lake, the return was delayed until the afternoon of 25 May by which time the area was no longer threatened.

The Village of Kinuso prepared to receive evacuees and obtained a small supply of blankets from High Prairie. Only approximately 35 people moved into the Village and these were accommodated in private homes.

In the move and care of evacuees from the Faust area, there was excellent co-operation between the departments and agencies concerned. It involved the Emergency Measures Co-ordinator for the High Prairie Unit, the Department of Lands and Forests, the Department of Municipal Affairs, the RCMP, the Town Authorities and the High Prairie School Division.

On 24 May an Indian village at Sandy Lake was threatened. As there is no road into the area, Lands and Forests evacuated the inhabitants by helicopter to Wabasca. Through the Department of Public Welfare it was established that there was ample congregate lodging available in the Wabasca area but only 85 evacuees were involved and were accommodated in the homes of friends and relatives. By 26 May the Sandy Lake area was no longer threatened and 53 of the evacuees were returned by helicopter. The remainder decided to remain for a visit in Wabasca.

Planning

The possibility of having to evacuate the Wabasca area was considered and plans to meet this eventuality were initiated. This move would have involved from 1,500 to 2,000 people, and could have been made by road.

It was estimated that with the privately owned vehicles and school buses available, the move could be carried out without additional transport from outside. In the Town of Slave Lake the municipal authorities considered arrangements for the care of these evacuees.

The Town of Slave Lake itself was not in immediate danger but there was a threat that the Town might have to be evacuated. The Mayor and Council made plans for warning the population and marshalling them for an organized move out of the area. It was determined that the Northern Alberta Railway could make available sufficient rolling stock if exit by road was cut off.

Publicity

The Honourable Harry E. Strom, Minister in Charge of Alberta Emergency Measures issued an information release stating that, although the situation was very serious, it was not considered critical enough to declare a state of emergency under the Civil Defence and Disaster Act. Municipalities were also informed of how to obtain assistance through the Emergency Measures Organization.

The emergency demonstrated the need for the development of peacetime disaster plans at the municipal level. ▲

RADIOLOGICAL (*Continued from page 3*)

TABLE 3

Province	High Range Survey Meter	Low Range Survey Meter	Dosimeters	Dosimeter Chargers
British Columbia ..	630	390	1844	990
Alberta	736	1045	9728	4373
Saskatchewan	235	235	583	235
Manitoba ...	525	525	1050	531
Ontario	1990	700	14068	6000
Quebec	1820	500	4820	2170
New Brunswick	182	34	599	180
Prince Edward Island	40	—	100	150
Nova Scotia ...	290	290	595	290
Newfoundland	80	82	160	160
Totals:	6323	3596	33144	14874

The above figures include purchases made or equipment ordered before July, 1968.

In addition to the training mentioned above, specialist courses in radiological defence for government departments, especially Agriculture and Fisheries, are conducted at the Canadian Emergency Measures College. Requirements for radiological data by other government departments to provide for effective operation in a nuclear war are under study.

Many international and national councils on radiological defence have been established. These include the International Radiation Protection Association, the U.S. National Council on Radiation Protection and Measurement and the Canadian Defence Research Board's Radiation Protection Panel. In addition, the Canadian Interdepartmental Radiological Defence Working Group studies the problem of radiation hazards and provides guidance to governments and industry on the total requirement for for Radiological Defence. ▲

REORGANIZING (*Continued from page 8*)

side "mobs" which in turn may have police assistance from evacuated or food-poor communities. Primary loyalties are to the local group and its leaders who are focusing first on the group's short-range needs. Violence is common when these groups meet. Pitched battles have occurred accentuating the nuclear disaster by forcing survivors to devote a substantial portion of their effort to the problems of local security.

Fear and rumors increase the instability of the accident-prone situations and frequently lead to unfortunate clashes triggered by misconstrued information. Suspicion of outsiders grows to include all of the non-local government efforts – especially those which attempt to requisition supplies without offering solid or acceptable compensation.

12. *Prognosis:*

The country is on the verge of a second major disaster – a collapse of all but local community authority with little prospect of an early re-establishment of the preattack constitutional structure. The prevailing expectation among the pessimists is a total shattering of the country into numerous independent groups which over years – perhaps decades – would have to evolve a new federation into the "second U.S.A." The optimists are hoping that an effective federal authority can be reconstituted within a year or two through the imposition of marshal law – an action which is made difficult by the magnitude of the problem, the inexperience of the army, the weakness of federal authority, and the widespread factionalism and loyalty conflicts within the military forces.

(To be continued)

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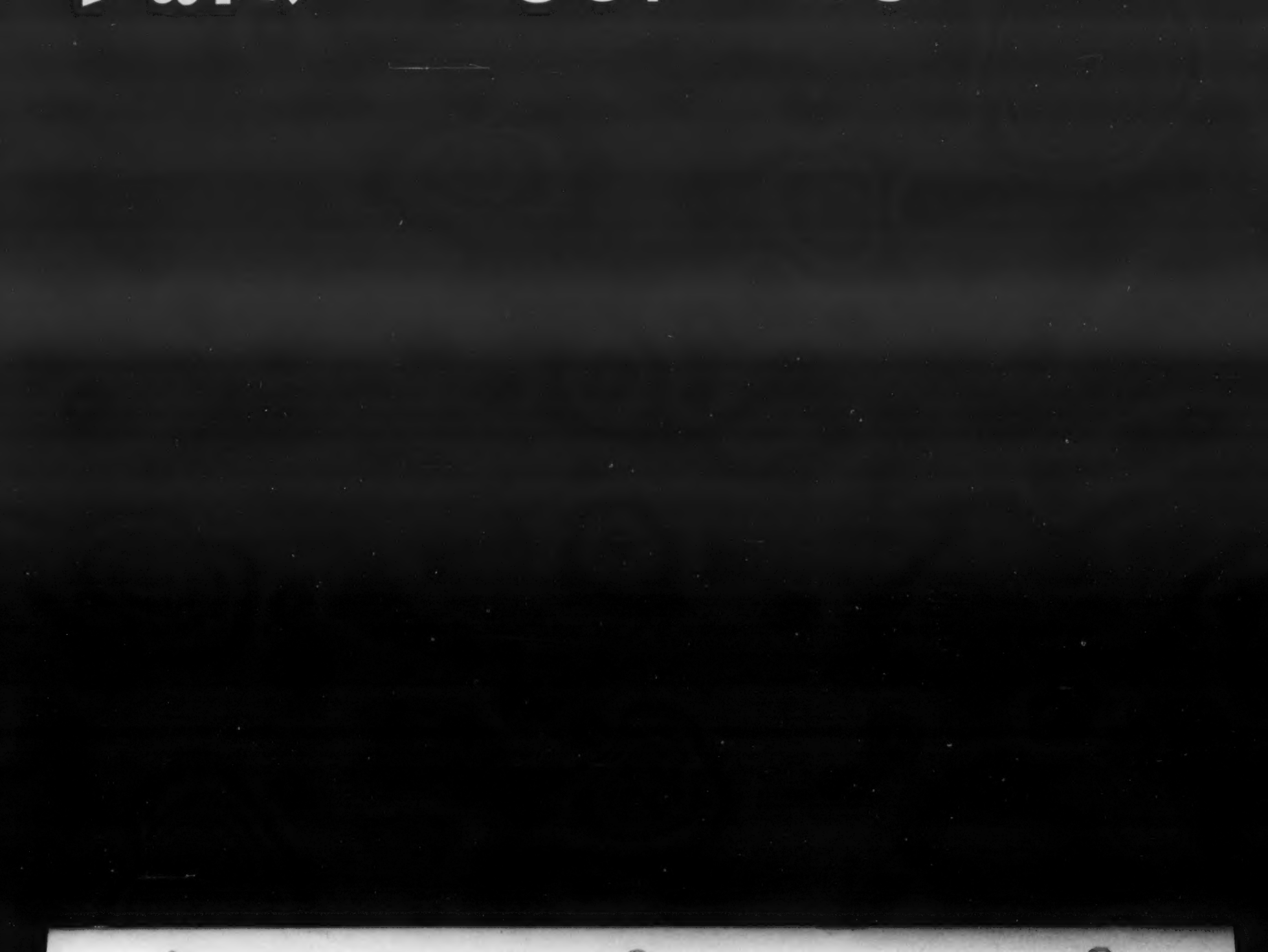
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